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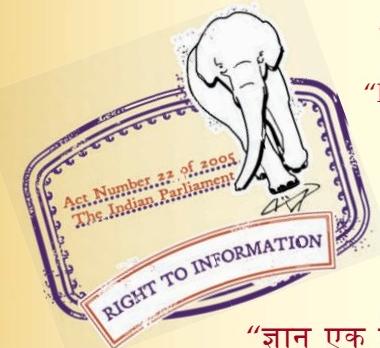
“Step Out From the Old to the New”

IS 10820-1 (1984): Methods of measurement for radio equipment used in mobile services, Part 1: General definitions and conditions of measurement [LITD 12: Transmitting Equipment for Radio Communication]

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Bhartṛhari—Nītiśatakam

“Knowledge is such a treasure which cannot be stolen”



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Indian Standard

METHODS OF MEASUREMENT FOR
RADIO EQUIPMENT USED IN
MOBILE SERVICES

PART I GENERAL DEFINITIONS AND
CONDITIONS OF MEASUREMENT

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Indian Standard

METHODS OF MEASUREMENT FOR RADIO EQUIPMENT USED IN MOBILE SERVICES

PART I GENERAL DEFINITIONS AND CONDITIONS OF MEASUREMENT

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Indian Standard

**METHODS OF MEASUREMENT FOR
RADIO EQUIPMENT USED IN
MOBILE SERVICES**

**PART I GENERAL DEFINITIONS AND
CONDITIONS OF MEASUREMENT**

0. FOREWORD

0.1 This Indian Standard (Part 1) was adopted by the Indian Standards Institution on 23 February 1984, after the draft finalized by the Radio Communications Sectional Committee had been approved by the Electronics and Telecommunications Division Council.

0.2 The object of this standard is to standardize the conditions and methods of measurements for the testing of equipment used in mobile services so as to make possible the comparison of the results of measurements made by different observers. Limiting values of the various quantities for acceptable performance are not specified.

0.3 This standard is one of a series of standards on methods of measurements to ascertain the characteristics and performance of the equipment used in mobile services. Other parts likely to be brought out in this series would cover methods of tests on:

- a) Transmitters employing A3E or F3E emissions;
- b) Receivers for A3E or F3E emissions;
- c) Transmitters employing single-sideband emissions (R3E, H3E or J3E);
- d) Receivers employing single-sideband techniques (R3E, H3E or J3E);
- e) Methods of measurement for signalling equipment; and
- f) Privacy equipment (Supplementary definitions).

0.4 This standard is largely based on IEC Publication 489-1 Methods of measurement for radio equipment used in the mobile, services: Part 1 General definitions and standard conditions of measurement, issued by the International Electrotechnical Commission.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the results of a test shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard (Part 1) applies to radio transmitting and receiving, equipment and systems used in the mobile services.

1.1.1 The scope of the standard is restricted to land and mobile stations in the mobile services and does not cover mobile satellite services. The standard also applies to portable and personal equipment which may operate in one or more radio-frequency channels in the frequency range below 1000 MHz and is intended for the transmission and the reception, either in a simplex or a duplex mode, of emissions modulated by a single information channel.

1.1.2 In this standard, the equipment included the aerial change-over device or the duplexer, if used, but does not include:

- a) aerial or aerial system except in the case of equipment using integral aerials;
- b) input transducer of the transmitter;
- c) output transducer of the receiver except in the case of equipment using integral transducers.

2. TERMINOLOGY

2.0 For the purpose of this standard the following terms and definitions in addition to those given in IS : 1885 (Part 23)-1967† shall apply.

2.1 Mobile Service — A radiocommunication service between mobile and land stations, or between mobile stations:

- a) *Aeronautical Mobile Service* — A mobile service between aeronautical stations and aircraft stations, or between aircraft stations, in which survival craft stations may also participate; emergency position-inflating radio beacon stations may also participate in this service on designated distress and emergency frequencies.
- b) *Land Mobile Service* — A mobile service between base stations and land mobile stations, or between land mobile stations.

*Rules for rounding off numerical values (*revised*).

†Electrotechnical vocabulary: Part 23 Radio telegraphy and mobile radio.

- c) *Maritime Mobile Service* — A mobile service between coast stations and ship stations, or between ship stations or between associated on board communications; survival craft stations and emergency position indicating radio beacon stations may also participate in this service.
- d) *Port Operations Service* — A maritime mobile service in or near a port, between coast stations and ship stations, or between ship stations, in which messages are restricted to those relating to the operational handling, the movement and the safety of ships and, in emergency, to the safety of persons.

Messages which are of a public correspondence nature shall be excluded from this service.

2.2 Station — One or more transmitters or receivers, or a combination of transmitters and receivers, including the accessory equipment, necessary at one location for carrying on a radiocommunication service, or the radio astronomy service. Each station should be classified by the service in which it operates permanently or temporarily:

- a) *Land Station* — A station in the mobile service not intended to be used while in motion.
- b) *Aeronautical Station* — A land station in the aeronautical mobile service. In certain instances an aeronautical station may be located for example on board ship or on a platform at sea.
- c) *Aeronautical Fixed Station* — A station in the aeronautical fixed service.
- d) *Base Station* — A land station in the land mobile service.
- e) *Coast Station* — A land station in the maritime mobile service.
- f) *Fixed Base Station* — Base station which is permanently located at a known and precisely described geographical point.
- g) *Mobile Station* — A station in the mobile service intended to be used while in motion or during halts at unspecified point.
- h) *Aircraft Station* — A mobile station in the aeronautical mobile service other than a survival craft station, located on board an aircraft.
- j) *Land Mobile Station* — A mobile station in the land mobile service capable of surface movement within the geographical limit of a country or continents.
- k) *Ship Station* — A mobile station in the maritime mobile service located on board a vessel which is not permanently moored, other than a survival craft station.

m) *Survival Craft Station* — A mobile station in the maritime mobile service or the aeronautical mobile service intended solely for survival purposes and located on any life boat, life-raft or other survival equipment.

n) *Port Station* — A coast station in the port operations service.

2.3 Simplex Operation — Operating method in which transmission is made possible alternately in each direction of a telecommunication channel, for example by means of manual control.

NOTE — Simplex operation may use either one or two frequencies in radio-communication.

2.4 Duplex Operation — Operating method in which transmission is possible simultaneously in both directions of a telecommunication channel.

NOTE — In general, duplex operation requires two frequencies in radio-communication.

2.5 Transmitter — A device used in the mobile services for converting audio-frequency signals intended for the transmission of speech or data, combined or not with selective calling signals or control signals, into required frequency, phase, amplitude or pulse-modulated radio-frequency signals.

2.6 Receiver — A device used in the mobile services for converting frequency, phase, amplitude or pulse-modulated radio-frequency signals into required speech or audio-frequency output signals.

2.7 Duplexer — A device allowing the same antenna to be used for simultaneous transmission and reception.

2.8 Base (Coast) (Aeronautical) Equipment — A transmitter or receiver, or a combination of both a transmitter and a receiver, used in a base station (coast) (aeronautical) either fixed or not.

NOTE — This class of equipment is designated in this standard by Category A.

2.9 Mobile Equipment — A transmitter or receiver, or a combination of both a transmitter and a receiver, including the duplexer, if used, in a mobile station.

2.10 Vehicle Equipment — Equipment which is permanently mounted in a vehicle and connected to the vehicle power-supply sources. For this definition, the term 'Vehicle' is intended to refer to land, sea and airborne conveyances.

NOTE — This class of equipment is designated in this standard by Category A.

2.11 Portable Equipment — Mobile equipment which is hand-carried or worn on the person, and which is operated from its own power supply and with a self-contained antenna.

NOTE — This class of equipment is designated in this standard by Category B.

2.12 Personal Equipment — Portable equipment which is capable of being worn within clothing.

NOTE — This class of equipment is subject to less severe environmental conditions than other classifications of portable equipment. It is designated in this standard by Category C.

2.13 Portable Vehicle Equipment — Mobile equipment which is capable of being operated both from the vehicle power supply and antenna when the equipment is temporarily mounted in a vehicle, and from its own power supply and with a self-contained antenna when it is hand-carried or worn on the person.

NOTE — This class of equipment is designated in this standard by Category A/B.

2.14 Useful Battery (or Power Supply) Life in Portable and Personal Equipment — The number of days, or parts thereof, that the equipment will operate under specified conditions of intermittent operation on a single complement of specified, fresh or fully charged batteries, before the end-point voltage has been reached.

2.15 End-point Voltage — The on-load voltage of the battery which results in a specified amount of degradation in the overall performance of the equipment.

3. GENERAL CONDITIONS OF MEASUREMENT

3.1 General Requirement Concerning the Measuring Equipment — The measuring equipment used shall be of a type which has been demonstrated to give reproducible results with an accuracy in excess of that required for the measurement. In addition, care shall be taken to ensure that the performance of the test equipment and the disposition of the various pieces of equipment are such as not to influence the results of the measurements.

3.2 Standard Test Conditions — Care shall be taken to avoid all conditions which may lead to damage to the equipment under standard test conditions.

Unless otherwise specified, the measurements shall be carried out under standard test conditions.

Measurements under standard test conditions shall be made with the operating conditions specified in 4, the standard conditions for primary power supply specified in 5 and the standard atmospheric conditions specified in 6.

4. OPERATING CONDITIONS

4.0 The following conditions are applicable to all tests described in this standard.

4.1 Basic Equipment — The equipment shall be assembled and any necessary adjustments shall be made in accordance with the manufacturer's instructions for the mode of operation required. When alternative modes are available, the equipment shall be assembled and adjusted in accordance with the relevant instructions. A complete series of measurements shall be made for each mode of operation.

4.2 Associated Equipment — The associated equipment to be used with the equipment during tests shall be that with which it normally operates.

In mobile equipment, the receiver, transmitter and normal power-supply unit shall be included and operated in the housing(s) supplied with the equipment.

In land station equipment, the normal power-supply unit and other chassis that might effect the operation shall be included and operated in the cabinet(s) supplied with the equipment.

4.3 Special Function Sub-System — In those cases where the equipment is provided with special function sub-systems, for example continuous tone coded muting (squelch), selective calling and, with receivers impulsive noise blankers, the sub-system shall be disabled. If not, this fact shall be recorded with the results of the measurements.

4.4 Standard Test Modulation — Certain measurements are performed by using sinusoidal standard test modulation. The specific test modulation shall be stated in the relevant specification.

The modulation is considered to be sinusoidal if:

- a) the harmonic distortion of the audio-frequency signal used for testing the transmitter section is less than 1 percent, and
- b) in the radio-frequency signal used for testing the receiver section, the harmonic distortion of the modulation is less than 2 percent.

5. STANDARD CONDITIONS FOR THE PRIMARY POWER SUPPLY

5.1 General — The standard test voltage shall be specified by the manufacturer in accordance with the provisions of 5.2 to 5.5 and shall, unless otherwise stated (*see also Note under 5.2*), refer to the voltage at the power supply input connector (*see Note under 5.2*) of the equipment when the latter is in operation.

The test voltage shall be measured with the aid of a voltmeter having a class index of 0·5 and shall not deviate from the stated value by more than \pm 2 percent during a series of measurement carried out as part of one test on one equipment, except when the battery life in portable equipment is determined.

NOTE — If the equipment is normally provided with a non-detachable cord or cable, the input connector of the cord or cable may be considered to be the power input connector of the equipment. Consequently, the test voltage may be measured at this point. This condition, together with details concerning type, cross-section and length of the cord or cable used, shall be stated with the results of the measurements.

5.2 Standard dc Test Voltage for Equipment Supplied by Accumulator Batteries which are Normally Charged when the Equipment is in Operation (Category A) — For equipment intended to be supplied by accumulator batteries external to the equipment, which are normally being charged when the latter in operation, the standard dc. test voltage specified by the manufacturer preferably shall be equal to the standard test voltage of Table 1 multiplied by the number of cells in the battery to be used.

TABLE 1 VOLTAGES PER CELL (V)

TYPE OF ACCUMULATOR (1)	NOMINAL VOLTAGE (2)	STANDARD TEST VOLTAGE (3)	OPERATING VOLTAGE	
			Max (4)	Min (5)
Lead accumulators	2·0	2·20	2·6	1·8
Nickel-cadmium accumulators with incorporated gas-vent	1·2	1·40	1·6	1·1
Nickel-cadmium accumulators of the sealed type	1·2	1·25	1·5	1·1

NOTE 1 — The maximum and minimum operating voltages are listed for the purpose of testing equipment.

NOTE 2 — Accumulators for use in aircraft may have characteristics which differ from those listed here.

If the standard test voltage is not specified, the standard test voltage listed in Table 1 shall be considered to be the standard test voltage.

NOTE — In certain equipment specifications, mainly concerning those cases where relatively large currents are drawn from the dc supply, the test voltage may be specified as a function of this current. In this case, the cable normally supplied with the equipment shall be included in the measurements and the test voltage shall be measured at the end of the cable which is normally connected to the battery. By way of example, test voltages for different operating currents for equipment intended for

connection to lead storage batteries with a nominal voltage of 6 V or 12 V are given below:

Nominal 6 V Power Supply

Operating Current A	Test Voltage V
Less than 10	6.6
10 to 22	6.5
22 to 36	6.4
36 to 54	6.3
54 to 70	6.2
Greater than 70	6.1

Nominal 12 V Power Supply

Operating Current A	Test Voltage V
Less than 6	13.8
6 to 16	13.6
16 to 36	13.4
36 to 50	13.2
Greater than 50	13.0

5.3 Standard dc Test Voltage for Equipment Supplied Either by Primary Cells or Batteries, or Accumulator Batteries which are not Charged While the Equipment is in Operation (Categories B and C) — For equipment supplied either from self-contained primary cells or batteries, or from self-contained accumulator batteries not normally being charged while the equipment is in operation, the standard test voltage specified by the manufacturer for each applicable battery complement shall not exceed the on-load voltage measured after at least 10 percent of useful battery life has been completed.

If the standard test voltage is not specified, the on-load voltage after 10 percent of useful battery life has been completed, measured according to 10 shall be considered to be the standard test voltage.

All measurements, except that for determining the useful battery life, shall be performed at a standard test voltage with a permissible deviation of ± 2 percent.

For measurements of certain characteristics performed at standard test voltage, the batteries may be disconnected, but not removed, and an external source may be connected through screened leads.

5.4 Standard ac Voltage and Frequency for Equipment Using Other Power Supplies — The standard ac test voltage shall be equal to the nominal specified by the manufacturer.

If the equipment is provided with different input taps, the one designated nominal shall be used.

The standard test frequency shall be equal to the nominal frequency.

During the measurements, the test frequency, like the test voltage, shall not deviate from its nominal value by more than ± 2 percent.

5.5 Standard dc Test Voltage for Portable Vehicle Equipment (Category A/B) — The equipment specification for portable vehicle equipment shall contain a statement concerning the test voltage to be used, according to and/or 5.2 and 5.3.

In the absence of any statement to the contrary, the lower of the two voltages mentioned above shall be used.

6. STANDARD ATMOSPHERIC CONDITIONS

6.1 General — Measurements under standard atmospheric conditions shall be carried out under the conditions stated in 6.2. If necessary, the results of the measurements may be corrected by calculation to the standard reference temperature of 20°C and the standard reference air pressure of 1.013×10^5 Pa. If this correction is not possible, the measurements shall be performed at the standard referee conditions specified in 6.4.

6.2 Standard Atmospheric Testing Conditions — Measurements and mechanical tests, the results of which are either independent of temperature and air pressure, or may be corrected by calculation to the standard reference temperature and air pressure stated in 6.3, may be carried out at any existing combination of temperature, humidity and air pressure, provided they are within the following limits:

Temperature	$+ 15^\circ\text{C}$ to $+ 35^\circ\text{C}$
Relative humidity	45 percent to 75 percent
Air pressure	0.86×10^5 Pa to 1.06×10^5

The temperature and relative humidity shall be substantially constant during a series of measurements carries out as a part of the one test on one given equipment.

NOTE — Where it is impracticable to carry out measurements under standard atmospheric conditions for testing, a note to this effect stating the actual conditions shall be added to the test report.

6.3 Standard Atmospheric Reference Conditions — If the quantities to be measured depend on temperature, humidity and/or air pressure and the law of dependence is known, the quantities are measured under the conditions given in 6.2 and, if necessary, the values obtained are corrected by calculation to the following standard reference values:

Temperature	20°C
Air pressure	1.013×10^5 Pa

NOTE — No requirements for relative humidity are given because a correction by calculation is generally not possible.

6.4 Standard Atmospheric Referee Conditions — If the quantities to be measured depend on temperature, humidity and air pressure and the law of dependence is unknown, the measurements shall be made at the following sets of conditions:

Temperature	$+ 25^\circ\text{C} \pm 1^\circ\text{C}$
Relative humidity	48 to 52 Percent
Air pressure	0.86×10^5 Pa to 1.06×10^5 Pa

The test report shall give the actual values of temperature, relative humidity and air pressure during the measurements.

7. STANDARD DAILY DUTY-CYCLE CONDITIONS

7.1 The equipment may be rated as either continuous or intermittent according to the following conditions.

7.1.1 Continuous Operation of Base Equipment or Vehicle Equipment (Category A)—Continuous operation denotes operation of the transmitter at rated radio-frequency output power and of the receiver at rated audio-frequency output power under the manufacturer's normal recommended loading conditions for 24 h.

7.2 Intermittent Operation of Vehicle Equipment (Category A)—The standard duty-cycle for intermittent operation is 1 min transmit at rated radio-frequency output power and 4 min receive at the rated audio-frequency output power under the manufacturer's normal recommended loading conditions for a period of 8 h, followed immediately by three cycles of 5 min transmit and 15 min receive at rated output power.

Consequently, the standard duty-cycle shall be performed 9 h each day followed by 15 h rest.

7.3 Intermittent Operation of Portable and Personal Equipment (Categories A/B, and C)—The standard duty-cycle for intermittent operation of portable and personal equipment shall be one of the following:

- a) For equipment containing a transmitter and a receiver and having a power input less than or equal to 60 W, the duty-cycle shall be 6 s receive at rated audio-frequency output power, 6 s transmit at rated radio-frequency output power, followed by 48 s standby; this cycle being repeated for a period of 8 h.
- b) For equipment containing a transmitter and a receiver and having a power input less than 1·0 W, the duty cycle shall be 3 s receive at rated audio-frequency output power, 3 s transmit at rated radio-frequency output power, followed by 54 s standby; this cycle being repeated for a period of 8 h.
- c) For equipment containing only a transmitter (or a receiver), the duty-cycle shall be 6 s transmit (or receive) at rated output power, followed by 54 s standby; this cycle being repeated for a period of 8 h.

Consequently, the standard duty-cycle shall be performed 8 h each day followed by 16 h rest, unless a different duty-cycle is specified.

8. EVALUATION OF THE PERFORMANCE OF THE EQUIPMENT UNDER CONDITIONS DEVIATING FROM STANDARD TEST CONDITIONS

8.1 General — If required, the performance characteristics of the equipment shall be determined during or after a period within which the equipment is subjected to test conditions which are different from the standard test conditions specified in 3.2.

The amount of degradation of the performance characteristics that may be regarded as acceptable, as well as the environmental conditions at which the tests shall be made, shall be specified in the equipment specification.

9. INITIAL MEASUREMENTS UNDER STANDARD TEST CONDITIONS

9.1 General — Before starting the tests described in 9.2, 9.3, 9.4 and 9.5 the performance characteristics shall be evaluated under the standard test conditions (see 3.2).

As these characteristics may depend on temperature and humidity and the law of dependence is generally unknown, the measurements shall be made at the standard referee conditions specified in 6.4.

9.2 Variation of Primary Power Supply Voltage Range Within the Specified Range.

9.2.1 General — The power supply voltage range is primary supply voltage over which the equipment shall operate with a specified performance.

9.2.2 Conditions of Measurement — The equipment shall be operated under the atmospheric conditions mentioned in 9.1 and the power supply voltage shall be varied in accordance with 9.2.2.1, 9.2.2.2, 9.2.2.3 and 9.2.2.4.

9.2.2.1 Equipment supplied by accumulator batteries which are normally charged when the equipment is in operation — Unless otherwise specified, the maximum value and minimum value of the test voltage shall be equal to the maximum voltage and minimum voltage per cell of Table 1, multiplied by the number of cells of the battery (see 5.2).

9.2.2.2 Equipment supplied either by primary cells or batteries or accumulator batteries which are not charged while the equipment is in operation — The maximum value and minimum value of the test voltage shall be equal to those specified in the equipment specification (see also 5.3).

Unless otherwise specified, the test shall include a measurement at the battery end-point voltage (*see 10*).

The measurements at the maximum value and minimum value of the power supply voltage may be combined with (or replaced by) the measurements for determining the useful battery life described in 10.

9.2.2.3 Voltage and frequency for other power supplies — The maximum value and minimum value of both the test voltage and frequency shall be equal to those specified in the equipment specification (*see also 5.4*).

NOTE — Ship and airborne equipment may be tested at nominal voltage \pm 10 percent, but a high-voltage test (for example, + 25 percent during a specified period) and a low voltage test (- 20 percent) are usually required.

9.2.2.4 Voltage for portable and personal equipment — The measurements shall be made in accordance with 9.2.2.1 and/or 9.2.2.2 (*see also 5.3*).

9.3 Temperature Range

9.3.1 General — The term temperature range refers to the range of ambient temperature over which the equipment shall operate with a specified performance.

9.3.2 Conditions of Measurements — The equipment shall be tested at the lower limit and at the higher limit of the temperature range specified in the equipment specification using, unless otherwise specified, the procedures described in IS:9000 (Part 2/Sec 4)-1977* and IS:9000 (Part 3/Sec 4)-1977†.

The tests shall be made at standard test voltage (*see 5*). If required by the equipment specification, the measurements shall be repeated at the extreme limits of the power supply voltage range, in accordance with 9.2.

9.3.3 Method of Measurement — The following method of measurement is a summary of the test procedures described in IS:9000 (Part 2)-1977‡ and IS:9000 (Part 3)-1977§. However, these standards shall be consulted when carrying out the measurements.

9.3.3.1 Initial procedure during the cold and dry-heat tests — The equipment and associated equipment in its normal enclosure, while being at

Basic environmental testing procedures for electronic and electrical items:

*Part 2 Cold test, Section 4 Cold test for heat dissipating items with gradual change of temperature.

†Part 3 Dry heat, Section 4 Dry heat test for heat dissipating items with sudden change of temperature.

‡Basic environmental testing procedures for electronic and electrical items:

Part 2 Cold test.

Part 3 Dry heat test.

the ambient temperature of the working space, shall be placed, in the switched-off 'ready for use' condition, in a box or chamber the temperature of which can be accurately measured and controlled.

The temperature of the chamber, while initially being at the ambient temperature of the working space, shall be adjusted to the specified value. The rate of change of temperature shall not exceed 1°C/min, average over a period of not more than 5 min.

The equipment shall be exposed to the specified temperature conditions until its temperature reaches equilibrium. The equipment shall then be switched on and operated at standard test voltage to check whether it is capable of functioning. The procedure is continued as described in 9.3.3.2 and 9.3.3.3.

9.3.3.2 Cold test — The equipment is switched off exposed to the low temperature condition for a further period of 2 h without forced circulation of air directly on the equipment.

At the end of this period, the equipment is switched on and evaluated at the low temperature.

9.3.3.3 Dry-heat test — The equipment shall remain in operation under the appropriate standard duty-cycle test condition specified in 7, the temperature being maintained at the specified temperature without forced circulation of air directly on the equipment.

The equipment shall be evaluated at that temperature.

Irrespective of the specified temperature, the absolute humidity during the complete test shall not exceed 20 g of water per cubic metre of air. This corresponds approximately to 50 percent of relative humidity at 35 °C.

NOTE — For certain classification of ship and airborne equipment, the tests given above may not suffice. For example, during the cold (dry-heat) test equipment may have to be stabilized first at a certain low (high) non-operating temperature before the measurements are made at the low (high) operating temperature.

9.4 Humidity

9.4.1 Conditions of Measurement — When tests under specified conditions of humidity are required, such tests shall be carried out under the conditions specified in IS : 9000 (Part 4)-1979*.

The tests shall be made at the standard test voltage. If required by the equipment specification, the measurements shall be repeated at the extreme limits of the power supply voltage range in accordance with 9.2.

9.4.2 Method of Measurement — The following method of measurement is a summary of the test procedure described in IS : 9000 (Part 4)-1979*. This standard should however be consulted when carrying out the measurements.

*Basic environmental testing procedures for electronic and electrical items: Part 4 Damp heat (steady state).

The equipment and associated equipment in its normal enclosure, while being at the ambient temperature of the working space, shall be placed in the switch-off ready for use condition, in a humidity chamber, unless otherwise specified, capable of maintaining the temperature at $50 \pm 2^{\circ}\text{C}$ and a relative humidity between 90 percent and 95 percent.

The air in the chamber shall be stirred and the chamber shall be so designed that neither mist nor condensed water can reach the equipment.

The equipment shall be exposed to the specified humidity conditions for a period which depends upon the required class of severity mentioned in the equipment specification.

At the end of this period, the equipment is switched on and evaluated while maintaining the specified humidity conditions.

In addition, a temperature variation test and a test under conditions of 100 percent humidity may be required.

NOTE — For certain classifications of ship and airborne equipment, the combinations of temperature and humidity listed above may not suffice. Additional ranges are under consideration.

9.5 Other Environmental Conditions — These tests are not applicable to equipment used in land stations.

9.5.1 *Vibration*

9.5.1.1 General — Vibration stability is the ability of the equipment to maintain specified mechanical and electrical performance during and after being vibrated.

9.5.1.2 Conditions of measurement — The conditions of measurement and the degree of severity appropriate to the category of equipment considered shall be selected from those specified in IS:9000 (Part 8)-1981*.

9.5.2 *Shock*

9.5.2.1 General — Shock stability is the ability of the equipment to maintain specified mechanical and electrical performance after being shocked.

9.5.2.2 Conditions of measurement — The condition of measurement and the degree of severity appropriate to the category of equipment considered shall be selected from those specified in IS:9000 (Part 7/Sec 1)-1979†.

*Basic environmental testing procedures for electronic and electrical items: Part 8
Vibration (sinusoidal) test.

†Basic environmental testing procedures for electronic and electrical items: Part 7
Impact test, Section 1 Shock.

10. USEFUL BATTERY LIFE

10.1 This is normally applicable only to portable and personal equipment (Categories A/B, B and C).

10.2 Conditions of Measurement — The equipment shall be operated under standard conditions of intermittent operation according to 7.3 under the atmospheric conditions mentioned in 9.1 with a fresh or fully charged complement of specified batteries.

10.3 Method of Measurement — The performance characteristics of the equipment shall be determined in accordance with the relevant standards. The time to reach a specified degradation of the characteristic under test is measured and test continued until the end-point voltage of the battery complement, as indicated by a specified degradation of the characteristic under test, has been reached.

10.3.1 In a transmitter or in equipment, the transmitting part of which is supplied by a separate battery, the battery end-point, unless otherwise specified, is considered to be reached if:

- a) output power or the average radiated power is reduced 6 dB from the manufacturer's rating, or
- b) frequency error of the radio-frequency signal exceeds the specified frequency tolerance.

10.3.2 In a receiver or in equipment, the receiving part of which is supplied by a separate battery, the battery end-point, unless otherwise specified is considered to be reached if:

- a) reference sensitivity is reduced 6 dB from the manufacturer's rating.
- b) in equipment comprising a receiver and a transmitter supplied by a common battery, the battery end-point is determined by one of the conditions mentioned above.

10.4 Presentation of the Results — Battery life is expressed in days, or parts thereof. One day of life is 8 h of operation at standard conditions of intermittent operation according to 7.3.

Record the average of three trials, performed either consecutively on the same equipment or simultaneously on three specimens of the equipment.

It is recommended that a graph shall be plotted representing the on-load voltage of the battery (on the ordinate) as a function of time (on the abscissa), in order to check the requirement with regard to the standard test voltage specified by the manufacturer, as given in 3.3.

It is also recommended that graphs shall be plotted representing the measured characteristics mentioned in 10.3 (on the ordinate) as a function of time (on the abscissa).

The ambient temperature, the humidity and particulars regarding the duty-cycle shall be stated with the results of the measurements.

11. SIZE AND WEIGHT

11.1 The size is a measure of the space occupied by the basic equipment with all detachable accessories removed.

11.1.1 *Method of Measurement* — The size of the basic equipment case shall be measured in the three dimensions: depth, width and height. The three dimensions shall be obtained from the inside of a rectangular box which is large enough to contain the basic equipment case. Accessories not included with the size of the basic equipment, which may be temporarily or permanently attached to the basic equipment and are necessary to its use, shall be listed.

11.2 The weight of the equipment included that of the basic equipment and accessories required for the intended use.

11.2.1 *Method of Measurement* — The equipment shall be weighed, including all mounting accessories required for operation during its intended use.

(Continued from page 2)

**Radio Communications Equipment for
Mobile Services Subcommittee, LTDC 20:1**

Convener

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INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

<i>Quantity</i>	<i>Unit</i>	<i>Symbol</i>
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

<i>Quantity</i>	<i>Unit</i>	<i>Symbol</i>
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

<i>Quantity</i>	<i>Unit</i>	<i>Symbol</i>	<i>Definition</i>
Force	newton	N	1 N = 1 kg. m/s ²
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m ²
Frequency	hertz	Hz	1 Hz = 1 c/s (s ⁻¹)
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m ²